Semester II

MCA201 Operations Research

Course Code	MCA201	Course Title	Operations Research
Course Type	Core	Contact Hours	4 Hours per Week
Credit	3	Domain	Mathematics

Syllabus	
I	Linear programming problems - Mathematical formulation, graphical method of solution, simplex method
II	Duality in linear programming problems, dual simplex method, sensitivity analysis, transportation and assignment problems, Traveling salesman Problem.
III	Game theory Introduction, two-person zero-sum games, some basic terms, the maxmini-minimax principle, games without saddle points-Mixed Strategies, graphic solution of 2 * n and m*2 games, dominance property. CPM & PERT- project scheduling, critical path calculations, Crashing.
IV	Queueing theory -basic structure of queuing systems, roles of the Poisson and exponential distributions, classification of queues basic results of M/M/1: FIFO systems, extension to multi-server queues.
V	Simulation: simulation concepts, simulation of a queuing system using event list,pseudo random numbers, multiplication congruential algorithm, inverse transformation method, basic ideas of Monte-Carlo simulation.

REFERENCE BOOKS:
Taha.H.A ,operation Research : An Introduction, McMilan publishing Co., 1982. 7th ed.
Ravindran A, Philips D.T &Solbery.J.J, Operations Research: Principles and practice, John Wiley & Sons, New York, 1987.
Frank S. Budnick, Dennis Mcleavey and Richard Mojena, Principles of Operations Research for Management. All India Traveler Book seller, Delhi.
Gillet.B.E., Introduction to Operations Research - A Computer oriented algorithmic approach, McGraw Hill, 1987.

Hillier.F.S&Liberman.G.J, operation Research, Second Edition, Holden Day Inc, 1974.

COURSE PRE-REQUISITES:

Familiarity with Linear Algebra , MCA 101

COURSE OBJECTIVES:

To introduce the students how to use variables for formulating complex mathematical models in management science, linear programming, game theory, queuing theory and simulation.

COURSE OUTCOMES:

CO. No	Course Outcome description
MCA201.1	Formulate a real-world problem as a mathematical programming model.
MCA201.2	Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand.
MCA201.3	Solve specialized linear programming problems like the transportation and assignment problems
MCA201.4	Understand the basic concept of game theory and queuing theory.
MCA201.5	Understand the network analysis techniques and Simulation.

CO-PO AND CO-PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
MCA201.1	2	1													
MCA201.2			2												
MCA201.3	2		1												
MCA201.4		2	1												
MCA201.5		2		2											

MCA202 Java Programming

Course Code	MCA 202	Course Title	Java Programming
Course Type	Core	Contact Hours	4 Hours per Week
Credit	3	Domain	Computing

Syllabus	
I	Basics of Java: Java - What, Where and Why?, History and Features of Java, Internals of Java Program, Difference between JDK,JRE and JVM, Internal Details of JVM, Variable and Data Type, Unicode System, Naming Convention. OOPS Concepts: Advantage of OOPs, Object and Class, Method Overloading, Constructor, static variable, method and block, this keyword, Inheritance (IS-A), Aggregation and Composition(HAS-A), Method Overriding, Covariant Return Type, super keyword, Instance Initializer block, final keyword, Runtime Polymorphism, static and Dynamic binding, Abstract class and Interface, Downcasting with instanceof operator ,Package and Access Modifiers, Encapsulation, Object class, Object Cloning, Java Array, Call By Value and Call By Reference
II	Core java Features: String Handling, Exception Handling, Nested classes, Packages and Interfaces. Multithreaded Programming – synchronization, Input/Output – Files – Directory ,Utility Classes, Generics, Generic Class, Generic methods.
III	Serialization: Serialization & Deserialization, Serialization with IS-A and Has-A, Transient keyword. Networking: Socket Programming, URL class, Displaying data of a web page, InetAddress class, DatagramSocket and DatagramPacket, Two way communication
IV	JDBC: - Overview, JDBC implementation, Connection class, Statements, Catching Database Results, handling database Queries. Error Checking and the SQLExceptionClass , The SQLWarning Class, JDBC Driver Types, ResultSetMetaData, Using a Prepared Statement, Parameterized Statements, Stored Procedures, Transaction Management. Collection: Collection Framework, ArrayList class, LinkedList class, ListIterator interface, HashSet class
V	Introducing AWT: Working with Windows Graphics and Text. Using AWT Controls, Layout Managers, adapter classes and Menus. Swing: Basics of Swing, JButton class, JRadioButton class, JTextArea class, JComboBox class, JTable class, JColorChooser class, JProgressBar class, JSlider class, Displaying Image, JMenu for Notepad, Open Dialog Box

	Java applets- Life cycle of an applet – Adding images to an applet – Adding sound to an applet. Passing parameters to an applet. Event Handling.

REFERENCE BOOKS:

JAVA The Complete Reference- Patrick Naughton and Herbert Schidt.- fifth Edition Tata McGraw Hill.
The Complete reference J2SE - Jim Keogh – Tata McGraw Hills
Programming and Problem Solving With Java, Slack, Thomson Learning, 1Edn.
Java Programming Advanced Topics, Wigglesworth, Thomson Learning, 3Edn.
Java Programming, John P. Flynt , Thomson Learning, 2Edn.
Ken Arnold and James Gosling, The Java Programming language, Addison Wesley, 2nd Edition, 1998
Patrick Naughton and Herbert Schidt. The Complete Reference, JAVA fifth Edition Tata McGraw Hill.
Maydene Fisher, Jon Ellis, Jonathan Bruce; JDBC API Tutorial and Reference, Third Edition, Publisher: Addison-Wesley
Thinking java – Bruce Eckel – Pearson Education Association

COURSE PRE-REQUISITES:

MCA102, MCA 106

COURSE OBJECTIVES:

1. To understand and comprehend object-oriented programming concepts using Java
2. To provide a comprehensive coverage of Internet programming using java.
3. To achieve the designing of platform independent applications

COURSE OUTCOMES:

CO. No	Course Outcome description
MCA202.1	Ability to solve problems using only pure object-oriented concepts
MCA202.2	Make decision to solve a problem using package, library and threads Handling Errors and Exceptions
MCA202.3	Able to develop networking applications
MCA202.4	Ability to design and develop database applications
MCA202.5	Design and develop software solutions

CO-PO AND CO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MCA202.1	2	2	1								2			2	
MCA202.2	2	2	1		2						2			2	
MCA202.3	2	2	2								2			1	
MCA202.4	2	2	2		2						2				

MCA202.5	2	2	2		2		1		2		3	

MCA203 Advanced Software Engineering

Course Code	MCA203	Course Title	Advanced Software Engineering
Course Type	Core	Contact Hours	4 Hours per Week
Credit	3	Domain	Professional Core

Syllabus	
I	**Introduction to Software Engineering**, Process Models, Understanding Requirements **Agile methodology**- Agile – Primer, Manifesto, Characteristics, Daily Stand-up, Definition of Done, Release Planning, Iteration Planning, Product Backlog
II	**Requirements Modelling**- Analysis, UML Models, Data Modelling, Class-Based Modelling, Webapps **Design Concepts**- Design Model, Software Architecture- Styles- Design, Component Level Design- Class based Components, User-Interface Design- Interface Analysis, Interface design, WebApp Design
III	**Software Quality Assurance**, Software Testing Strategies, Testing Applications- Conventional-Object-oriented- Web,
IV	**Project Management Concepts**- Process Metrics, Estimation, Scheduling, Risk Management, Maintenance and re-engineering
V	DevOps - JUnit - git - github - Docker - Containers - Continuous Integration - Selenium - HTTP loadtestingtool-Designpatterns.

REFERENCE BOOKS:
Software Engineering, a Practitioner's Approach- Roger S Pressman 7th Edition, Tata Mc-Graw Hill Publishing Co. Ltd.
Software Engineering – Ian Somerville 9th Edition, Pearson Education
An Integrated Approach to Software Engineering- Pankaj Jalote 3rd edition, Narosa Publishing House
Fundamentals of Software Engineering- Ghezzi, Jazayer's and Mandriolli 2nd Edition, PHI
Software Engineering principles & Practice- Waman S Jawadekar 2nd Edition, Tata Mc-Graw Hill Publishing Co. Ltd.
Software Project Management: Pankaj Jalote, Pearson Education

Software Project Management –A Unified Framework: Walker Royce, Pearson Education.
Software Project Management –S A Kelkar .Prentice Hall India
SeleniumSimplified, secondedition.

COURSE PRE-REQUISITES:

Basic Knowledge in Computer Science Programming

COURSE OBJECTIVES:

1. Knowledge of basic Software Engineering methods and practices, and their appropriate application

2. A general understanding of software process models.

3. An understanding of software requirements and the SRS document.

4. An understanding of design concepts and different software architectural styles.

5. An understanding of implementation issues such as modularity and coding standards.

6. An understanding of approaches to verification and validation including static analysis, and reviews. and software testing approaches

7. An understanding of software evolution and related issues such as version management.

8. An understanding on quality control and how to ensure good quality software.

9. An understanding on quality control and how to ensure good quality software.

10. An understanding of the role of project management including planning, scheduling, risk management, etc.

11. Understanding the latest tools in Software engineering

COURSE OUTCOMES:

CO. No	Course Outcome description
MCA203.1	To analyse, design and manage the development of a computing-based system, using different process models
MCA203.2	To understand the design methodology available for software engineering practice
MCA203.3	To understand software testing and quality assurance techniques at the module level, and understand these techniques at the system level

MCA203.4	To understand the project management concepts
MCA203.5	To use various Developmental platforms , testing tools etc used in SE

CO-PO AND CO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MCA203.1	2	3	2					2	3					1	
MCA203.2	2	2			2			2						1	
MCA203.3		2			2			2						1	
MCA203.4						1			2		3			1	
MCA203.5						1			3		2			1	

MCA204 Design and Analysis of Algorithms

Course Code	MCA204	Course Title	Design and Analysis of Algorithms
Course Type	Core	Contact Hours	4 Hours per Week
Credit	3	Domain	Computing
Syllabus			
I	**Introduction**: Algorithm, Concepts in performance analysis – space complexity and time complexity, Asymptotic Notations **Sorting**: Analysis of - Bubble sort, Selection sort and Insertion sort **Searching**: Analysis of - Linear Search, Binary Search and Interpolation Search. **Hashing Techniques**: Different hashing functions, methods for collision handling.		
II	**Divide and Conquer Strategy:** General method, Finding the maximum and minimum, Analysis of Binary search, Quick sort and Merge sort **Branch and Bound**: Travelling Sales Man Problem **Backtracking**: The 8 queen's problem, sum of subsets.		
III	**Dynamic Programming**: Introduction, Drawback of Recursion, Elements of Dynamic Programming, Matrix Chain Multiplication and Longest Common subsequence **Greedy Algorithms**: Huffman Codes, Activity Selection Problem, Elements of Greedy Strategy, 0-1 knapsack problem, fractional knapsack problem		
IV	**Graph Algorithms**: Breadth First Search, Depth First Search. DFS: Strongly Connected Components and Topological Sort Minimum Spanning tree: Kruskal and Prims algorithms, Shortest path: Single Source Shortest path (Dijkstra's Algorithm) and all pair shortest path		
V	**Number Theoretic Algorithms**: Strassen's matrix multiplication.		

	NP Hard and NP Complete Problems: Basic concepts, non-deterministic algorithm, class of NP- hard and NP- complete **Approximation Problems**: Basic terminology, vertex coloring problem – different approximation algorithms, travelling sales man problem.
REFERENCE BOOKS:	
Introduction to Algorithms - Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest	
Fundamentals of algorithms – Gilles Brassard, Paul Bratley (PHI),C1996	
Introduction to the design and analysis of algorithms – AnanyLevitin (Pearson),2011	
Design & Analysis of Algorithms-A A Puntambekar	

COURSE PRE-REQUISITES:

MCA205

COURSE OBJECTIVES:

1. Learn and understand the fundamental algorithms and analyse the performance.
2. Understand the fundamental algorithmic design strategies.
3. Learn how to develop efficient algorithms for simple computational tasks and reasoning about the performance and correctness of them.

COURSE OUTCOMES:

CO. No	Course Outcome description
MCA204.1	Understand and use asymptotic notations to analyse the performance of basic algorithms
MCA204.2	Identify, analyse and evaluate various Algorithm Design Strategies and solve Problems: Divide and Conquer, Branch and Bound, Backtracking strategies
MCA204.3	Identify, analyse and evaluate various Algorithm Design Strategies and solve Problems: Dynamic programming, Greedy Strategy
MCA204.4	Identify, analyse and evaluate various Graph Algorithm s and Solve Problems
MCA204.5	Understand the basic concept of Number Theory and related Algorithms, NP Hard and NP Complete Problems and Approximation Problems

CO-PO AND CO-PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
MCA204.1		3		2										1	
MCA204.2		3	3	2										1	
MCA204.3		3	3	2										1	
MCA204.4		3	1	2										1	
MCA204.5		1		2										1	

MCA205 Artificial Intelligence

Course Code	MCA205	Course Title	Artificial Intelligence
Course Type	Core	Contact Hours	4 Hours per Week
Credit	3	Domain	Professional Core
Syllabus			
I	**Module 1:** Introduction - Overview of AI applications. Introduction to representation and search. The Propositional calculus, Predicate Calculus, Using Inference Rules to produce Predicate Calculus expressions, Application – A Logic based financial advisor.		
II	**Module 2:** Introduction to structure and Strategies for State Space search, Graph theory, Strategies for state space search, Using the State Space to Represent Reasoning with the Predicate calculus (Sate space description of a logical system, AND/OR Graph). Heuristic Search : introduction, Hill-Climbing and Dynamic Programming, The Best-first Search Algorithm, Admissibility, Monotonicity and informedness, Using Heuristics in Games.		
III	**Module 3:** Building Control Algorithm for Statespace search – Introduction, Production Systems, The blackboard architecture for Problem solving. Knowledge Representation – Issues, History of AI representational schemes, Conceptual Graphs, Alternatives to explicit Representation, Agent based and distributed problem solving.		
IV	**Module 4:** Strong Method Problem Solving – Introduction, Overview of Expert System Technology, Rule Based Expert system, Model -Based, Case-Based and Hybrid Systems (Introduction to Model based reasoning, Introduction to Case Based Reasoning, Hybrid design), Introduction to Planning. Reasoning in Uncertain Situation – introduction, logic based Adductive Inference. Introduction to PROLOG , Syntax for predicate Calculus programming, ADTs, A production system example.		
V	**Module 5:** Machine Learning: Symbol Based – Introduction, Frame – work. The ID3 Decision tree Induction algorithm. Inductive bias and Learnability, Knowledge and Learning,		

	Unsupervised learning, Reinforcement Learning, Machine Learning : Connectionist – Introduction, foundations, Perceptron learning. Machine learning: Social and emergent: Models, The Genetic Algorithm, Artificial Life and Social based Learning.

TEXT/REFERENCE BOOKS:

George F Luger, Artificial Intelligence – Structures and Strategies for Complex problem solving, 5thEdn, pearson.

E. Rich, K. Knight, S B Nair, Artificial intelligence, 3rdEdn, McGraw Hill.

S. Russel and p. Norvig, Artificial intelligence – A Modern Approach, 3rdEdn, Pearson

D W Patterson, introduction to Artificial Intelligence and Expert Systems, PHI, 1990

Nilsson N.J., Artificial Intelligence - A New Synthesis, Harcourt Asia Pvt. Ltd.

COURSE PRE-REQUISITES:

MCA 101

COURSE OBJECTIVES:

- To provide a strong foundation of fundamental concepts in Artificial Intelligence
- To provide a basic exposition to the goals and methods of Artificial Intelligence
- To enable the student to apply these techniques in applications which involve perception, reasoning and learning

COURSE OUTCOMES:

CO. No	Course Outcome description
MCA205.1	Understand the various underlying concepts in Artificial Intelligence
MCA205.2	Acquire the knowledge of search techniques used in Artificial Intelligence
MCA205.3	Acquire the concepts of knowledge representation
MCA205.4	Analyse and design a real-world problem for implementation and understand the dynamic behaviour of a system.
MCA205.5	Use different machine learning techniques to design AI machine and enveloping applications for real world problems.

CO-PO AND CO-PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P01 0	PO1 1	P01 2	PSO 1	PSO 2	PSO 3
MCA205.1	3	2													
MCA205.2	3	2													
MCA205.3	3	2													
MCA205.4	3	2	2	2											
MCA205.5	3	2	2	2											

MCA206 Web Technology Lab

Course Code	MCA206	Course Title	Web Technology Lab
Course Type	Core	Contact Hours	6 Hours per Week
Credit	3	Domain	Computing
Syllabus			
I	HTML Basics, CSS, Javascript, Ajax, Json, XML, PhP Basics		

II	Laravel-
	 Installation
	  Application Structure
	  Configuration
	  Routing
	  Middleware
	  Namespaces
	  Controllers		

III	Request Cookie Response Views Blade Templates Redirections Working with Database Errors & Logging Forms Localization Session Validation File Uploading Sending Email Ajax Error Handling Event Handling		
IV	Facades Contracts CSRF Protection Authentication Authorization Artisan Console Encryption Hashing Artisan Commands		
V	Development of web-based application with Database connectivity		
COURSE OUTCOMES:			
CO. No	**Course Outcome description**		
MCA206.1	To become familiar with client server architecture and able to develop a web application using various technologies.		

MCA206.2	To understand and develop a web-based application using a framework concept
MCA206.3	To gain the skills and project-based experience needed for entry into web application and development careers.

CO-PO AND CO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MCA206.1	1	2	3				2					2		1	
MCA206.2	2	2	3				2					3		1	
MCA206.3	2	2	3				3					3		1	

MCA207 Java Programming Lab

Course Code	MCA207	Course Title	Java Programming Lab
Course Type	Core	Contact Hours	4 Hours per Week
Credit	2	Domain	Computing
Syllabus			
I	• Program to illustrate class, objects and constructors • Program to implement overloading, overriding, polymorphism etc.		
II	• Program to implement the usage of packages • Program to create user defined and predefined exception • Program for handling file operation • Directory manipulation in java		
III	• Implement the concept of multithreading and synchronization • Program to implement Generic class and generic methods • Socket programming to implement communications • Broadcasting program using UDP protocol • Program for downloading web pages from the internet using URL.		
IV	• Program to implement JDBC in GUI and Console Application		
V	• Applet program for passing parameters • Applet program for loading an image and running an audio file • Program for event-driven paradigm in Java • Event driven program for Graphical Drawing Application • Program that uses Menu driven Application		
TEXT/REFERENCE BOOKS:			
JAVA The Complete Reference- Patrick Naughton and Herbert Schidt.- fifth Edition Tata McGraw Hill.			